This Week in SP333:6031: Homework, etc.

for the week of 27 August

Problems to submit on the date listed:

Week of 03 Sep

Monday :	
Tuesday:	2:3, A4
Thursday:	2: 7, 8, A5
Friday:	2: 9,12, 13
Monday	2: 15, A6

A4. The text suggests that a spacecraft could reach the moon by leaving the surface (airless) of the earth at less that the standard escape velocity. (a.) Set up the one dimensional potential energy that includes the graviatational potential due to the earth and the moon along the line joining their centers. Assume the moon to earth mass ratio is $\gamma = 1.23 \times 10^{-2}$. (b.) Find the point between the these bodies at which the net potential has its maxmum. (c.) Interpret the first derivative condition physically so we understand why the spacecraft will reach the moon if it can just get past that point. (d.) What is the minimim speed for the spacecraft if it is to start at R_E and coast to the potential maximum point ? Express the answer as $(1 - \eta)\, v_{esc}$ where v_{esc} is the standard velocity for escape from the earth's surface. (e.) Find the speed necessary to escape the solar system starting at the earth's surface. Include the earth and the sun in you reasoning.

A5. Consider equation (2.19) and our trick for rewriting the acceleration.

$$v(x) = \pm\sqrt{2/m(E - V(x))} \quad ; \quad a = \frac{dv}{dx}\frac{dx}{dt} = v\frac{dv}{dx}$$

Compute dv/dx and then find an expression for m a. Comment. You have two square roots running around; choose the same sign for both.

A6. The position of a particle is $\vec{r}$. Compute $\vec{\nabla} r$, $\vec{\nabla} (r^{-1})$ and $\vec{\nabla} f(r)$. $r = |\vec{r}|$

Consider the question : Does the moon orbit around the earth ? (more in 6 weeks)